

Midyear Update of Ocean Conditions through June 2011

PDO and MEI Activity. Over the past few months, it has become clear that La Niña conditions are weakening, as indicated by values of the Pacific Decadal Oscillation (PDO), Multivariate ENSO Index (MEI) and Oceanic Niño Index (ONI)—each has become less negative. According to the [NOAA Climate Prediction Center](#), a transition to ENSO-neutral conditions occurred during May 2011, as sea surface temperatures at the equator increased to near-average values across much of the equatorial Pacific Ocean. The atmosphere has not completely transitioned, but remains in a weak La Niña state; however, it is likely transitioning to ENSO-neutral conditions.

Sea Surface Temperatures, Physical Spring Transition, and Coastal Upwelling. Sea Surface Temperatures (SSTs) were colder than average during winter 2011, running about 0.5°C below normal. However, SSTs in April–June were average. This likely reflects the weakening negative signal of the PDO. As for the spring transition, since the PDO was strongly negative in winter 2010–2011, the spring transition was early, occurring on day 106 (16 April 2011; the 6th earliest date in 15 years). This date is estimated from the Bakun (1973)/PFEL [upwelling index](#). It is often said that the "spring transition" marks the day when coastal upwelling is initiated; however, a more accurate statement is that it marks the day when winter storms end.

The spring transition, when estimated as the day when cold, upwelled water first appears in deep shelf waters at station NH 05 (i.e., the first cruise during which water colder than 8°C was observed at the 50-m depth), occurred on day 135 or 15 May 2011. Thus, even though the upwelling index suggests that upwelling was initiated relatively early, it was not intense enough to bring cold water up onto the shelf until 15 May. Lack of intense upwelling might be related to the neutral ENSO conditions.

Zooplankton. During winter 2010–2011, a high proportion of copepod biomass was composed of northern copepods (primarily *Pseudocalanus*, on the order of 90%). This is a good indicator and is often the pattern during winter, when the PDO is strongly negative as it was during autumn 2010 and winter 2010–2011.

Similarly, the copepod species-richness time series is showing strongly negative values from January through May. Through May, the northern copepods continued to dominate samples, as did large numbers of the pteropod, *Limacina helicina*. High biomass of northern species and high numbers of *Limacina* point to a greater-than-average transport of subarctic water into the northern California Current. The biomass of northern copepod species was extraordinarily high, in fact, the highest in our 15-year time series, at approximately 25 mg carbon m⁻³. This compares to an average of 11.1 mg carbon m⁻³ over the past 15 years.

Conclusions. It is clear that the cold La Niña conditions have come to an end, and that physically, the ocean may be transitioning to ENSO-neutral conditions. However, from a biological point of view, ocean conditions have been very good through June. Given

that physical conditions at the basin-scale are transitioning to a "neutral" state, it is likely that local biological conditions will also transition to an "average" state soon, probably by autumn. We suggest this because in past years, biological changes have followed major changes in physical parameters by 3–6 months.